Here is a list of free, online animations, videos, simulations, & demos that many talented people (these are not my intellectual property) have created in the chem ed and biochem ed communities. I've created this collated list to support colleagues as we move to #remoteinstruction #online learning.

Sincerely,
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https://www-jove-com.proxy.lib.miamioh.edu/science-education/chem
short video demonstrations to teach students fundamental techniques in science, medicine, and engineering

https://lists.columbia.edu/mailman/listinfo/onlinestemlabs
remote learning listserv for STEM laboratory teaching

https://teachchemistry.org/news/unlocked-resources-through-march-31
activities, animations, projects, simulations, videos, and more for elementary school, middle school, high school, and Advanced Placement.

https://www.rit.edu/cos/interactive/MINT/ivv-list.php
Interactive Video VignettesL short (15-20 minutes) online videos that use live-action and incorporate interactive features that let users make predictions, analyze data, answer questions and reflect on what they have learned.

https://www.indigoinstruments.com/3d-molecular-model-builder.php
renders most organic molecules in molymod style

https://wwnorton.com/find-your-rep
free visual, interactive resources (ChemTours & Stepwise Animations) from W.W.Norton Science through June 12, 2020. Contact your college (or high school) rep to get access.

https://www.youtube.com/watch?v=NrQDGgRiQfU
entropy and microstates

https://www.pogilpcl.org/get-connected
physical chemistry & pchem labs (fill out the form here to have access to Google drive)

https://www.101edu.co/covid
homework and practice for gen chem, intro chem & GOB (waiving fees for spring for campuses impacted by COVID-19)

https://www.alchem.ie/covid19
mechanisms app (learn and practice reaction mechanisms by moving and manipulating individual bonds and electrons)

https://connchem.org/about/
simulations for general chemistry topics

https://www.chemtube3d.com
interactive 3D animations and structures (extensive organic chemistry & polymer resources, proton NMR, also MOFs, lithium ion batteries, solid state, bioinorganic, protein folding, nanoparticles)

http://www.agbooth.com/pp_java/
protein purification, gel filtration, ion-exchange chromatography

https://digital.wwnorton.com/chem5
our current gen chem text has animations for every chapter in the traditional general chemistry textbook

https://edu.rsc.org/resources/titration-screen-experiment/2077.article
titration experiments (both acid base & redox)

https://edu.rsc.org/resources/aspirin-screen-experiment/1644.article
aspirin synthesis

https://phet.colorado.edu/en/simulations/category/chemistry
simulations (acid-base solutions, alpha decay, atomic interactions, balancing chemical equations, Beer's Law, beta decay, blackbody spectra, building molecules/atoms, concentration, conductivity, coulomb's law, electron diffraction, density, diffusion, double wells (tunneling & splitting, spin ½ particles), energy forms & changes, fourier transform, gases, greenhouse effect, isotopes & atomic mass, lasers, microwaves, models of H atom, molarity, light, molecular shape, neon lights & discharge tubes, nuclear fission, photoelectric effect, pH, quantum bound states, quantum wave interference, radioactivity, electromagnetic radiation, stoichiometry, reaction rates, reversible reactcions, Rutherford scattering, salts & solubility, semiconductors, MRI, states of matter, Stern-Gerlach experiment, sugar & salt solutions, wave on a string)

https://www.ionicviper.org
virtual inorganic pedagogical electronic resource

http://vischem.com.au/online-resources.html
videos, animations, & student worksheets for structure, reactivity & energetics

http://chemcollective.org/vlabs
virtual labs, simulations, & scenarios (stoichiometry, thermochemistry, kinetics, equilibrium, acid-base chemistry, solubility, redox, electrochemistry, analytical lab techniques, pchem, properties of solutions)

https://www.chm.davidson.edu/vce/index.html
molecular dynamics simulations (atomic orbitals, hybrid orbitals, ligand field theory, molecular geometry, elemental analysis, spectrophotometry, NMR, equilibria, kinetics, isomerization, electron structure, crystal structures & unit cells, gas laws, KMT, phase changes, calorimetry

http://mw.concord.org/modeler/
simulations in chemistry, physics, biology, biotech & nanotech

http://physics.bu.edu/~duffy/sims.html
HTML5 simulations for physics – could be useful for pchem/biophys

https://mdcune.psych.ucla.edu
neuroscience (including bioinformatics)

https://cellcollective.org/#
build models (metabolic networks, gene regulation, signal transduction, cell-cell interaction networks); perform simulations (extracellular and mutational conditions); analyze results (including drug re-purposing & combinatorial therapy)

https://docs.google.com/spreadsheets/d/1LtUpuQFNDj4mUd8GMr0KPeB9pM6h4q-sYdABJOK4V84/edit#gid=976431933
light & dark reactions in photosynthesis, cellular respiration, glycolysis, TCA cycle, purine biosynthesis, prokaryotic gene regulation, lac operon, transcription regulation, glucose homeostasis, positive & negative feedback loops

https://www.youtube.com/user/acapellascience
a capella physics & chemistry animations (quarks, CRIPSR, molecular recognition/shape, entropy)

https://www.merlot.org/merlot/materials.htm?category=2623
animations, assessment tools, case studies, Learning objects, simulations for all disciplines of chemistry (analytical, biochem, chem ed, environmental, inorganic, materials, nuclear, organic, physical, polymer/macromolecular, safety)

http://bio-alive.com
lectures, animations, tutorials, laboratories for bioengineering, chemistry, genomics, molecular biology, immunology, neuroscience, cell bio, nanotech,

https://chemdemos.uoregon.edu

simulations and demos

https://symotter.org
inorganic symmetry resources

https://www.youtube.com/user/1veritasium/videos
physics & chemistry videos, including nuclear chemistry

https://www.acs.org/content/acs/en/greenchemistry/students-educators/online-educational-resources/webinar-and-videos.html
green chemistry webinars and videos

https://teachchemistry.org/classroom-resources/multimedia
simulations, animations, videos, chemical safety videos

https://ocw.mit.edu/high-school/chemistry/demonstrations/videos/
videos of chem demos

https://www.youtube.com/channel/UCr1PT0JducMG1-SP8hpt18A
organic lab techniques (TLC, IR, extraction, dehydration of alcohol, GC, SN2 reactions of alkyl halides)
computer or virtual reality experiences for organic labs (Download free Wonda VR app, then use the QR code in this poster):

To view keyboard shortcuts, press question mark
View keyboard shortcuts

Can Technology Facilitate Inclusion and Diversity in Chemistry Teaching Laboratories?

Maria T. Gallardo-Williams @Teachforaliving
Department of Chemistry, College of Sciences, North Carolina State University

- VR experiences have been created and evaluated that can be used in place of traditional laboratories for the first semester of organic chemistry labs.
- **These VR experiences could be useful for students who are unable to be present in lab due to disabilities, attendance challenges such as pregnancy, or safety concerns**
- **The VR experiences are not intended to replace the traditional labs**
- Students that tried the VR experience reported a high degree of satisfaction and no significant usability barriers
- **During the evaluation process 23% of the student participants with minority status reported satisfaction with the direct attention received from the virtual teaching assistant (TA)**
- **30% of the student participants with minority status commented favorably on the diverse virtual TA pool**

Student Comment:
"I have never had a TA look me in the eye for so long and take such care to explain a concept to me. This felt very personal."

CH 222 VR TA Team

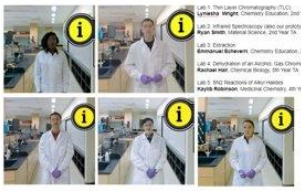

Figure 1: Diverse TA team provides representation across different ethnicities and genders

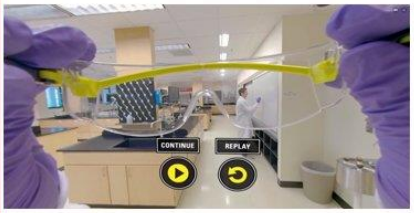

Figure 2: First person point of view: Putting on safety glasses

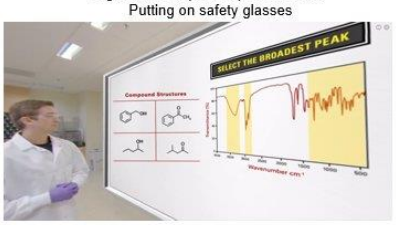

Figure 3: Analysis of results on virtual white board

How to access our demo VR experience:

- Download Wonda VR to your phone (free at Apple Store or Android Google Play Store)
- Open Wonda VR and choose "launch experience via QR code"
- Scan this QR code
- Choose the VR viewing mode (the one that looks like this)
- Drop your phone into Google cardboard or any other VR viewer
- This experience uses gaze navigation. If you want to make a choice or press a button you should focus your eyes on the object of your choice until you see a circle form on it
- The circle will expand to let you know that the button has been pressed, or the object has been selected

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